Procurement Process Challenges, Issues, and Lessons Learned from IER 305 and IER 441

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NCSP Technical Program Review
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OVERVIEW

- IER 441 Assembly Overview
- Difference Between IER 305 AND IER 441
  - Central Test Region Assembly
  - Hex Pitch
- IER 441 Procurement Issues and Delays
  - New Hardware
- SPRF/CX: IER 441 Hardware Test fit (Success)
- Lessons Learned
- Acknowledgements
IER 441 Assembly Overview

- **REACTIVITY AND CONTROL ROD BUNDLE ASSEMBLY, 1.02 HEX PITCH (J92803)**
- **CENTRAL TEST REGION ASSEMBLY, 0.81cm HEX PITCH (J92808)**
  - 85x 7uPCX TANTALUM TEST ROD (J92810)
- **GUIDE GRID PLATE STANDOFF (J92801)**
- **7uPCX TEST ROD**
- **LOWER GRID PLATE STANDOFF (J92799)**
- **DRIVE MOUNTING PLATE, 1.02cm HEX PITCH (J92811)**
- **UPPER GRID PLATE GUIDE, 1.02cm HEX PITCH (J92802)**
- **UPPER GRID PLATE, 1.02cm HEX PITCH (J92800)**
- **LOWER GRID PLATE AND HYDRO TUBE ASSEMBLY, 1.02cm HEX PITCH, (J92792)**
  - HYDRO TUBE ASSEMBLY, 1.02cm HEX PITCH (J92794)
  - HYDRO TUBE SPACER, 1.02cm HEX PITCH (J92797)**
Difference Between IER 305 AND IER 441

IER 305
• 1.55cm Hex Pitch

Central Test Region
• 0.81cm Hex Pitch

IER 441
• 1.02cm Hex Pitch

OUTER ALUMINUM TUBE

85X TANTALUM RODS
Manufacturing, Delivery, & Mission Success

There is a lot of inherent risk associated with manufacturing

- R&D hardware difficult to estimate timeframe due to first of a kind products
- Machining queue (other customers’ work can affect your schedule)
- Machine goes down
- Human or machine error and part is scraped
- Inexperience and short supply of capable machinist
- Subcontractor delays
- Material or hardware is not readily available (MS cannot be substituted with commercial hardware)
- Requestor (Redline, Updated, Modifications, Qty Changes, etc.)
- Rework
ML’s Process Stream Map

Start

Requestor

Submit Request

• Who’s SBS701 is current Complete Manufacturing Liaison Request Form
• Users request service through ML SharePoint site

Work type

Build, Modify/ Fix, Quote, Design for MFG review, Inspection

Technical Fabrication Coordinator

Review the Manufacturing Liaison Request Order.

Generate PR and RFQ

Helps determine possible suppliers generated PR / RFQ in Oracle system which sent automatically notifications suppliers
When the RFQ closes, forwards all quotes to the Requestor.

Suppliers

Respond to RFQ

Evaluate Bids LBMS

TFC or SP

TFC’s are Delegated Buyer under a SP
• If PO is awarded to a non-CPA manufacturer or is valued over $25k, an SP must approve it.

Requestor

TFC

• Coordinate pick-up and delivery of fabricated goods to Requester.

PO is Executed as appropriate

Delivery to Requestor

End

Inspectors

Review the Manufacturing Liaison Request Order.

Requestor

Archive inspection reports, material certifications, and any other pertinent documentation from the Supplier in Oracle

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Total: 170 entries
History of Procurement Issues

- Original request for quote (RFQ) went out on 03/28/2023
  - Manufacturing Liaison Request ML-54879
- No bids received, so reissued as four separate RFQs on 04/25/2023
  - ML-55721, ML-55722, ML-55814, & ML-55892
  - Requested Delivery Date of 08/01/2023
- By 05/01/2023 contracts were in place for all new equipment
  - Required additional attention (plenty of poking and prodding)
- No bid for ML-55722 (central test region parts)
  - Contacted Ridgeline MFG and convinced them to submit a quote
- Nearly all parts delivered well past the promise dates
- Guide Plate – The “Problem Child” of the group
  - 1st Attempt: Alva MFG (ML-55271) – Promise Date 07/05/2023, Never Received
    - Multiple delays led to termination of the contract for the guide plate on 11/01/2023
    - Additionally, Alva delivered other parts, but on 9 separate shipments: Created additional work for tracking and receipt inspections
  - 2nd Attempt: Ridgeline MFG (ML-56800) – Promise Date 11/16/2023, Received 12/01/2023
    - Non conformances (not anodized, holes not chamfered, etc.)
    - Sent back to Ridgeline for corrections
    - Reworked guide plate still did not meet requirements
  - 3rd Attempt: Backerworks MFG (Maximo) – Promise Date 02/16/2024, Received 02/01/2024
    - Returned for issues with holes (team visited Backerworks with guide and grid plates to discuss fixes)
    - Guide plate finished and will be inspected on 02/14/24
Tantalum Rod Marking (Eagle Mfg.) Delivered On Time

• Had to re-mark serial number per drawing requirements
  • Laser marking was done by SNL TA-5 machine shop
• The issue with the original marking process (stencil): not permanent – rubbing off some of the rods after minimal handling
Guide Plate Non Conformance (Ridgeline Mfg.)

- Anodize color not consistent with other grid plates
  - This issue alone could have been overlooked
- Chamfer on CE/SE cutouts on both sides did not meet drawing requirements
  - Control and Safety Elements do not drop correctly and may get held up
- “Addressing Lines” had errors and did not meet drawing requirements
- Grid plate holes not chamfered and deburred properly even after reworked
  - Outside of fuel rods being shaved off when loaded/unloaded
SPRF/CX: IER 441 Hardware Test fit (Success)
Conclusions

• IER 441 was the most challenging hardware procurement to date.
• I would consider using a sole-source/sole-make justification as required by the Department of Energy/National Nuclear Security Administration (DOE/NNSA).
• Once you submit ML RFQ and get bids you are required to select the company that has the best price and promise date.
• There are no consequences for companies that deliver late, however suppliers are sent a corrective action plan when their score falls below an acceptable level.

Lessons Learned:
- A little delay can cause an exponential increase in lead time.
- Money can’t always buy time.
- Understand risk from start to finish.
- Be aware of government procurement policies and regulations.
- Build and maintain good relationships (design team, manufacturers, ML, etc.).
- Focus on organization throughout the process (models, drawings, inspections, discussions, team dynamics, etc.)
Thank you!

- DOE NCSP: The critical experiments at Sandia are supported by the DOE Nuclear Criticality Safety Program (NCSP), funded and managed by the National Nuclear Security Administration for the Department of Energy.
Questions?
Design Control Requirements

Design Team
- Experimenters: David Ames, Gary Harms, Elijah Lutz
- Facility & Operations: Beth Hanson, Jason Soars, Patrick Ward
- Product Design: Augie Chapa, Alex Mace
- System Engineering & QA: Cassandra Wilson, Michael Black

Notable items required for newly implemented NQA-1 process
- Total documents (39)
- Total pages (over 250)
- Required signatures (105)
- Approval to proceed steps (4)
- Design Drawings (over 30)
- Additional Requirements (design analysis, acceptance test plan, committee reviews, bidding process, etc.)
IER 441 OVERVIEW

- Control and Safety Element bundle plates
  - Maintain spacing of the 4 rod clusters
- Grid Plates (Guide, Upper, and Lower)
  - Maintain spacing of fuel rods
  - Triangular pitch (1.02 cm)
- Central test region
  - Outer Diameter 9.5 cm
  - Length 78 cm
  - Dry cavity
  - Lined with cadmium
  - Maintain spacing of test rods
  - 85 test rod locations
  - Triangular pitch (0.81 cm)
- Tantalum rods
  - Pure tantalum (> 99.95%)
  - Dimensions match fuel rods (about 1 cm longer)
- Hydro Tubes and Springs
  - Gravity drop of control and safety elements